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REMARKS

In response to the office action of July 14, 2006, please amend the above-identified application. Claims 1-41 and 43 are cancelled. Claims 42 and 44 were previously withdrawn. New claims 45-68 are being presented.

Claims 32 and 36 were objected to because of ... informalities.

The objection is moot in view of the amendment.

Claims 25 and 32-39 were rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim subject matter which applicant regards as the invention.

The rejection is moot in view of the amendment.

Claims 1-3 and 19-41 were rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,677,586 issued to Nasser-Ghodsi et al. (hereinafter, Nasser-Ghodsi) in view of US Patent 5,665,277 to Johnson et al. (hereinafter, Johnson).

The rejection is moot in view of the amendment. However, the following remarks are submitted for consideration of the Primary Examiner.

Applicants claim structure and methods that are different and not recited, taught, or suggested in Nasser-Ghodsi in view of Johnson et al.

Claim 45 incorporates the subject matter of previous claim 1 and has been modified to include the further feature that the heating of the material is above either the vaporization

temperature or the sublimation temperature.

In addition to claim 45, new claim 46 is restricted by the fact that the two electron beams are generated by the same electron column but with different settings thereof. The Examiner has not produced any arguments in the Office Action which would support his allegation that this feature, too, will be obtained when one combines the two cited references. Since for evaporation, considerably more energy needs to be introduced into the material to be evaporated than is required for electron-beam induced etching, it is necessary to provide a separate electron source and a separate electron column for evaporation. And since neither document mentions that the electron flows can be varied over large ranges, this feature can hardly be regarded as obvious.

New claims 47 and 48 largely correspond to original claim 3 for which essentially the same applies as set out above with reference to claim 46. Furthermore, the Office Action does not give any understandable reasons whatsoever as to why the Examiner considers original claim 3 to be obvious.

Claim 49, which is likewise independent, is additionally restricted over claim 45 in that the second electron beam is of a higher intensity than the first one. Again, this feature is not disclosed anywhere in the two cited references. Claim 50 is additionally restricted in that the second electron beam provides a current in the 1 to 20 nA range. As understood, neither cited document (Nasser-Ghodsi or Johnson) mentions any similar electron beams.

Claim 53 has additionally been restricted to disclosing that the first electron beam

incident on the sample surface is focused and the second electron beam incident on the sample surface is defocused. Again, this feature is not disclosed anywhere in the documents cited by the Examiner.

Nasser-Ghodsi teaches an electron beam induced chemical etching process which includes repetitive steps and comparison of secondary electron emissions to determine different materials. Nasser -Ghodsi et al. is directed toward and discloses measuring secondary electron emissions as a way of determining that the material has been sufficiently etched to reach a different material exhibiting a different secondary electron emission. The information learned from the Nasser-Ghodsi invention is then utilized in the manufacturing processes in real time to make adjustments in the manufacture of the integrated circuits.

The instant invention is directed toward the repair and modification of ever-smaller devices including masks and integrated circuits as well as many other devices. Precision is necessary in the repair and modification of these devices.

Claim 45 of applicants invention includes a step where the material which is to be etched is irradiated with a first electron beam and a beam of molecules is activated by the first beam of electrons to produce an activated reaction product. The activated reaction product is then removed in the second step by locally heating the activated reaction product to a temperature above the vaporization temperature by a second beam of electrons.

New claim 68 includes a cleaning step and other steps as set forth in Table 2 of the

specification.

Nasser -Ghodsi et al. is fundamentally different from the invention as recited in independent claims 45, 46, 49 and 68 in that an activation step (reaction step) is employed followed by a removal step both of which are employed in a vacuum atmosphere. The specification page 5 lines 32 et seq. indicates that in order to confine the etching process to an area that has been exposed with a focussed electron beam and thus provide the high spatial resolution required it is necessary that the etching process does not occur spontaneously and at least one step in the reaction process has to be induced by electron beam exposure. Nasser -Ghodsi et al. generally performs both the activation and removal step at the same time and then performs a cleaning step to remove residual components with a laser followed by vacuuming. Independent claims 45, 46, 48 and 68 specify that the reaction gas is fed to the surface of the sample under vacuum conditions. The claimed invention is different and includes an activation step (reaction step) which is performed first with the combination of the e-beam, surface of the sample, the portion of the material to be etched and the reaction gas. At the conclusion of the reaction step a non-volatile and non-gaseous reaction product is left on/in the sample which is subsequently heated with a second e-beam to evaporate the reaction products.

Nasser -Ghodsi et al. does contemplate the removal of copper chloride which has a low vapor pressure using a tuned laser to vaporize the copper chloride without vaporizing nearby copper followed by use of a vacuum pump. However, Nasser-Ghodsi et al. does not

contemplate use of an electron beam to remove the material which forms the etch in the sample. Nasser-Ghodsi et al. indicates at col. 6 line 16 et seq. that "[o]ther techniques use high energy electron beams with various gases to etch away material without measuring or tuning for secondary emissions." Nasser-Ghodsi et al. is using tuned electron beams so as to measure secondary electron emissions from the etched material and/or to measure current induced through the substrate itself. It is therefore believed that Nasser-Ghodsi et al. is not amenable to the use of a second electron beam to vaporize the reaction products as the tuning for the emissions would be a non-trivial problem with the use of a second e-beam which may not be capable of solution.

As understood, Nasser-Ghodsi et al. is different insofar as resolution is concerned. A laser is limited to the resolution of about 0.5 times the wavelength of the light used in the laser. Therefore, nominal resolution would be about 200 nm or if the example of the tuned laser having a wavelength of 300-350 nm is used as set forth in column 6 line 33 et seq. is used then the resolution would be about 150-175 nm Far better resolution is achieved with e-beams as set forth in Table 1 of the application.

Regarding the new reference US 5,665,277, it must be pointed out that this document clearly relates to the generation of nanoparticles and has nothing to do with electron-beam inspection or electron-beam induced machining. As understood, there is only one passage in the entire document that describes heating by means of an electron beam as being equivalent to heating by means of other heat sources, namely in col. 2, lines 2-4.

Further, given the inherent differences in these beams it is respectfully suggested that the citation of the '277 patent to Johnson is inappropriate as it does not provide the required suggestion or motivation to modify Nasser-Ghodsi to arrive at the claimed invention.

As Johnson uses a two-stage gaseous jet process which requires the use of a gas in both steps, it not only teaches away from the instant invention but fails to provide any teaching, suggestion, or motivation to arrive at the invention as claimed.

Examiner's states that .." It would have been obvious to one skilled in the art to replace the laser beam of Nasser-Ghodsi with an electron beam because Johnson teaches that these two methods are functionally equivalent with respect to locally heating of a substrate to vaporize material" Applicant disagrees with this statement, neither Nasser-Ghodsi or Johnson provide any teaching, suggestion, or motivation to arrive at the invention as claimed. Specifically, coupling an electron beam to activate a material to be etched with a first electron beam, as in the instant application followed by a second electron beam that removes a reaction products from the surface of the material to be etched imparts several benefits including increased spatial resolution.

The generation of nanoparticles on the one hand, and electron-beam induced etching and/or electron-beam inspection on the other are to be considered two quite separate technical fields. Consequently, the application of a technology known from the field of nanoparticles generation to the field of electron-beam inspection and/or electron-beam

induced etching must indeed be regarded as an inventive activity.

It must be remembered that a person of ordinary skill in the art is a person that would not innovate. A person of ordinary skill in the art is one who thinks along the line of conventional wisdom and does not take to innovate. *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 454, 227 USPQ 293 (Fed. Cir. 1985).

Johnson is directed towards the method and apparatus of making nanoparticles. Johnson uses a non-reactive entrainment gas and uses separate reaction chambers to separate the evaporation conditions in different stages of the process. Both these aspects teach away from the claimed invention as well as the Nasser-Ghodsi reference. The claimed invention recites treatment with an electron beam prior to vaporization or sublimation.

A leap of logic is necessary to reach the conclusion that a person of ordinary skill in the art of mask repair, for example, would look to the art of nanoparticle formation and collection and combine it with the art of inspection and manufacturing processes for integrated circuits as taught by Nasser-Ghodsi to arrive at the invention as claimed in claim 45, 46, 49 and 68.

Neither Nasser-Ghodsi nor Johnson provides any teaching or motivation to arrive at the instant invention as claimed. MPEP section 2143.01 indicates that the prior art must suggest the desirability of the claimed invention. Nasser-Ghodsi is a method of inspecting integrated circuits and Johnson is directed toward producing nanoparticles which are transported in a vapor. Nasser-Ghodsi and Johnson are classified differently

"Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. 'The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art.' Here, it is respectfully suggested that the Examiner is improperly combining the references.

The problem to be solved by the Nasser-Ghodsi reference (inspection at different depths into a substrate) is totally different from the problem to be solved by the Johnson reference (formation of nanoparticles in a vapor plume and the collection thereof). Further, the problem to be solved by applicants' invention, to wit, a need for high spatial resolution for repair and modification of surfaces for ever-smaller devices is considerably different from the two cited references. The references themselves do not explicitly provide any suggestion or motivation for combining the references. Nor can any suggestion or motivation be implicitly found since the references are structurally and procedurally different from the instant invention and they are each directed toward solving different problems using different technology.

In *In re Kotzab*, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000) the court held that a "finding as to the specific understanding or principle within the knowledge of a skilled

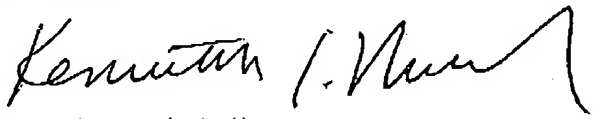
artisan that would have motivated one with no knowledge of [the claimed invention] to make the combination in the manner claimed" must be made. In the instant application, the Examiner has not identified a specific understanding or principle within the knowledge of the skilled artisan that would have motivated one with no knowledge of the claimed invention to make the combination in the manner claimed.

The undersigned invites a telephone call from the Examiner if it would expedite the processing and examination of the application.

If there are any additional charges, or any overpayment, in connection with the filing of the amendment, the Commissioner is hereby authorized to charge any such deficiency, or credit any such overpayment, to Deposit Account No. 23-3060.

Respectfully submitted,

Woodling, Krost and Rust



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